REMARKS

Applicants and the undersigned are most grateful for the time and attention accorded this application by the Examiner. In the Office Action dated September 14, 2007, claims 1, 4-7, 10-14, 17 and 18 were pending. Claims 1, 7 and 13 are independent; the remaining claims are dependent. Claims 1, 4-7, 10-14, 17 and 18 stand rejected. In response Applicants have filed this Amendment. The Office is respectfully requested to reconsider the rejections applied against the instant application in light of the foregoing amendments and the remarks presented below.

On February 13, 2008, Applicants' representatives and George Saon (a named inventor) conducted a telephone interview with the Examiner in which the instant application, the art of record, and the outstanding Office Action were discussed. While no specific agreements were reached regarding the instant application, it was agreed that Applicants would prepare and submit this Amendment to address the Examiner's concerns related in the outstanding Office Action. Particularly Applicants agreed to submit remarks further clarifying the meaning of certain claimed limitations disclosed in the original specification for the Examiner's convenience.

It should be noted that Applicants have amended and cancelled claims certain claims from further consideration in this application. Applicants are not conceding in this application that those claims are not patentable over the art cited by the Examiner, as the present claim amendments and previous cancellations are only for facilitating expeditious prosecution of the instant application. Applicants respectfully reserve the right to pursue these and other claims in one or more continuations and/or divisional patent applications.

Objection to the Disclosure

The Examiner has objected to the disclosure because of the following informalities: on page two, lines 6-8 and page 7, lines 13-15, the Examiner asserts that the Applicant failed to describe the complete subject matter in the specification from the mentioned reference of Fukunaga, or provided the corresponding disclosure of the reference in an IDS filing. Applicants respectfully submit that Fukunaga is background material on pattern statistics, well known to one skilled in the art, as is clear from its title and the context in which it is cited in the original specification. Moreover, because it is background material, it is not believed to be material to the patentability of the instantly claimed invention. Thus, further disclosure of the contents of Fukunaga are neither warranted nor required. Therefore, Applicants respectfully request reconsideration and withdrawal of the objection to the disclosure.

Rejections under 35 USC 112

Claims 1, 4-7, 10-14, 17 and 18 stand rejected under 35 USC 112, first paragraph, as failing to comply with the written description requirement. The Examiner asserts that the claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Applicants respectfully request reconsideration and withdrawal of these rejections.

Regarding claims 1, 7 and 13, the limitation "said objective function maximizes an average pairwise divergence over all dimensions at a single step" does not introduce new subject matter. As can be seen by the portion of the original specification regarding

the objective function (pp. 7-14), the mathematics underlying the instantly claimed invention clearly indicate that it is inherent that all dimensions be maximized at once, as the entire matrix is updated through the maximization of the objective function (which is iterative inasmuch as it can be accomplished through a gradient approach). More specifically, the objective function (average pairwise divergence) has as an argument (i.e., depends on) a matrix, θ. The gradient of the objective function is also expressed as a matrix, θ. Maximizing an objective function through gradient approach essentially means changing the argument by updating the objective function. The instantly claimed invention thus optimizes over all dimensions at once because it updates the entire matrix at once. The update is carried out iteratively in multiple steps (i.e., start with an initial θ_0, then get θ_1, ..., θn, until convergence). Thus, it is apparent that the entire matrix (all dimensions) will be updated through this single optimization process, rather than by a dimension-by-dimension process.

Nonetheless, in an effort to facilitate expeditious prosecution, Applicants have amended the independent claims to recite, *inter alia*, "optimizing the objective function through gradient decent, *wherein all dimensions of a matrix are optimized via optimizing the objective function*". Claim 1 (emphasis added). Applicants maintain that the claims did (and continue to) find support in the specification as originally filed because the claimed features are inherently disclosed by the mathematics underlying the objective function optimization process. Applicants are merely giving expression to the workings of the equations utilized in the instantly claimed invention, and are hopeful that the amended claim language will be sufficiently clear. Therefore, Applicants respectfully request reconsideration and withdrawal of these rejections under 35 USC 112.

Claim 18 stands rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Examiner asserts that the variables in the claimed equation are not defined so that the variables themselves and the equation are indefinite. Applicants respectfully request reconsideration and withdrawal of this rejection.

As previously detailed (and as detailed in the development of the equations in the original specification, pp. 7-14), the equation of claim 18 contains notation readily understood by those skilled in the relevant art. To the extent that it will help clarify matters, Applicants submit the following, commonly understood definitions to the variables found therein:

D_θ is the objective function (equivalent to the notation D_ θ);
C is the number of classes;
trace { } is the trace of a matrix (sum of diagonal elements);
θ is the projection matrix that is to be found;
^{T} denotes transpose of a matrix (e.g. θ^T);
S_i is the sum of all the covariance matrices (except self) and the mean vector outer products between class i and j;
p is the dimension of the projected space (p<=n).

Applicants respectfully submit that these more explicitly defined variables should enable the Examiner to more accurately apprehend claim 18, and that the original specification inherently disclosed as much to one of skill in the relevant art (which is admittedly a highly skilled art). Thus, Applicants respectfully request reconsideration and withdrawal of this rejection under 35 USC 112.

To the extent that the Examiner, after taking up and considering this Amendment, determines that there are still outstanding issues as regards compliance with the requirements of 35 USC 112, Applicants respectfully request that the Examiner contact the undersigned at the telephone number listed below.

Rejections under 35 USC 103

Claims 1 and 4-5 stand rejected under 35 USC 103(a) as being unpatentable over Watanabe et al. (US 5,754,681) (hereinafter "Watanabe") in view of Decell et al., *An iterative approach to the feature selection problem*, Machine Processing of Remote Sensing Data, 1972 (hereinafter "Decell"). Although the Examiner specifically addresses the remaining pending claims, he does not explicitly reject them. Therefore, Applicants request a clarification as to whether or not these claims are in fact rejected. Applicants proceed to discuss the claims irrespective of the Examiner's position, as it is Applicants position that, to the extent the Examiner has rejected these claims upon the art cited, that these claims are patentable for the same reasons that follow for the explicitly rejected claims. Applicants respectfully request reconsideration and withdrawal of the rejections under 35 USC 103(a).

As previously explained, Watanabe is irrelevant to the instantly claimed invention in as much as Watanabe teaches a design for a multitude of feature spaces, one for each class. This stands in stark contrast to the instantly claimed invention, wherein only one (common) feature space is designed for all classes. *Specification*, Figure 2 and accompanying text (particularly item 134).

Accordingly, in order to expedite prosecution, claim 1 *was previously* amended to recite, *inter alia*, "wherein there is *only one feature space transformation for all classes*." (Claim 1, emphasis added). Claims 7 and 13 have been amended to recite similar language. This language is intended to more clearly indicate that the instantly claimed invention performs one feature transformation for all classes, as disclosed in the specification and in contrast to Watanabe.

Regarding Decell, the teachings therein argue that the optimization should be carried out on the set of matrices satisfying $\theta * \theta^T = I$, where I is the identity matrix. This is explained in the proof of Theorem 1 on page 3B-6. Decell parameterizes the matrices in a certain form and teaches that it is enough to optimize n*(n-p) parameters. In the instantly claimed invention, the optimization is carried out in an unconstrained manner, i.e. over all possible matrices of size p x n which have p*n free parameters. This is explained on page 15 of the instant specification where the example is to try and find an 39x216 matrix through gradient decent without any particular structure or constraint.

Accordingly, in order to facilitate expeditious prosecution of the instant application, Applicants have amended the independent claims to recite, *inter alia*, "wherein the optimization is carried out in an unconstrained manner over all possible matrices." (Claim 1). This is intended to clarify that, in contrast to Decell, the instantly claimed invention optimizes the objective function in an unconstrained manner for all possible matrices, as disclosed in the original specification.

Moreover, Decell initializes the objective function with B such that $B*B^T = I$ and $b^2_{\{i,j\}} = b_{\{i,j\}}$ (see Decell, page 3B-9). This stands in stark contrast to the instantly claimed

invention, wherein the optimization of the objective function is with the LDA matrix (θ_0). In order to facilitate expeditious prosecution of the instant application, Applicants have amended the independent claims to recite, *inter alia*, "wherein the objective function is initialized with an LDA matrix." (Claim 1).

Therefore, Applicants respectfully submit that the instantly claimed invention is distinguishable form both Watanabe and Decell, either alone or in combination. Thus, Applicants respectfully request reconsideration and withdrawal of these rejections under 35 USC 103(a).

Conclusion

In view of the foregoing, it is respectfully submitted that independent Claims 1, 7 and 13 fully distinguish over the applied art and are thus allowable. By virtue of dependence from what are believed to be allowable independent Claims 1, 7 and 13, it is respectfully submitted that Claims 4-6, 10-12, 14, and 17-18 are also allowable.

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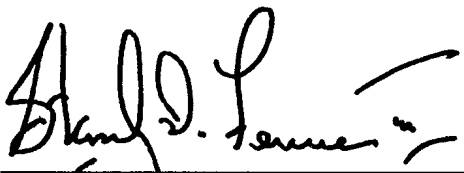
In summary, it is respectfully submitted that the instant application, including Claims 1, 4-7, 10-14 and 17-18, is in condition for allowance. Notice to the effect is hereby earnestly solicited. If there are any further issues in this application, the courtesy of a telephone interview is requested prior to the issuance of a further Office Action in this case.

Respectfully submitted,



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